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COMPUTER DECISIONS

THE MANAGEMENT MAGAZINE OF COMPUTING

A HAYDEN PUBLICATION

IBM's grand design • The security dilemma • Power protection for micros

HUMOR: THE MANAGEMENT EDGE

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The Rainbow 190: A new hard disk, more memory, but still IBM incompatible.

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in Rainbow 100 production at DEC's main assembly plant in Westfield, MA—that DEC is abandoning the machine. DEC spokesman Joe Codispoti explains that the upgraded Rainbow will be assembled at Westfield, with parts manufactured at other DEC sites.

The Rainbow 190 will available in July for between $6,495 (single purchase) and $4,990 (purchase of 100) each. Kits to upgrade Rainbow 100 to Rainbow 190 functionality will also be available in July. DEC says it will continue to sell and support the Rainbow 100. The purchase price of the Rainbow 190 includes VAX menu-interface software and the WPS-Plus program.

"Stand-alone personal computing is a thing of the past," says Henry Ancona, group manager of office and information systems. DEC's office-automation strategy is to create and tie together a family of desk-top computers that address the needs of a range of users, from the casual collector of electronic mail to the engineer.

Although Ancona sees the elimination of stand-alone micros for business use, the fact is that almost 80 percent of corporate micros were not connected to hosts or networks in 1984, according to Future Computing, a Richardson, TX-based market-research outfit. Future Computing predicts that in 1985, just over 75 percent of corporate personal computers will be stand-alone devices. □

SMALLER MICRO MAKERS CLAIM STRENGTH

Despite predictions that dire times are in store for smaller makers of personal computers, several of those vendors say their companies remain strong and competitive.

Future Computing Inc., the Dallas-based market-research group, predicts a relatively stable market until 1990. But George F. Colony, president of Forrester Research Inc., Cambridge, MA, predicts the micro market will become so rugged this year that "a number of vendors will burn in the aftermath." Colony named Eagle Computer Inc. (Garden Grove, CA), Columbia Data Products Inc. (Columbia, MD), and Corona Data Systems Inc. (Thousand Oaks, CA) as potential dropouts.

The prediction is hogwash, say the vendors. "We are very solidly entrenched with distribution channels," says Dan Carter, president of Corona. "We have new products that are in production and shipping today."

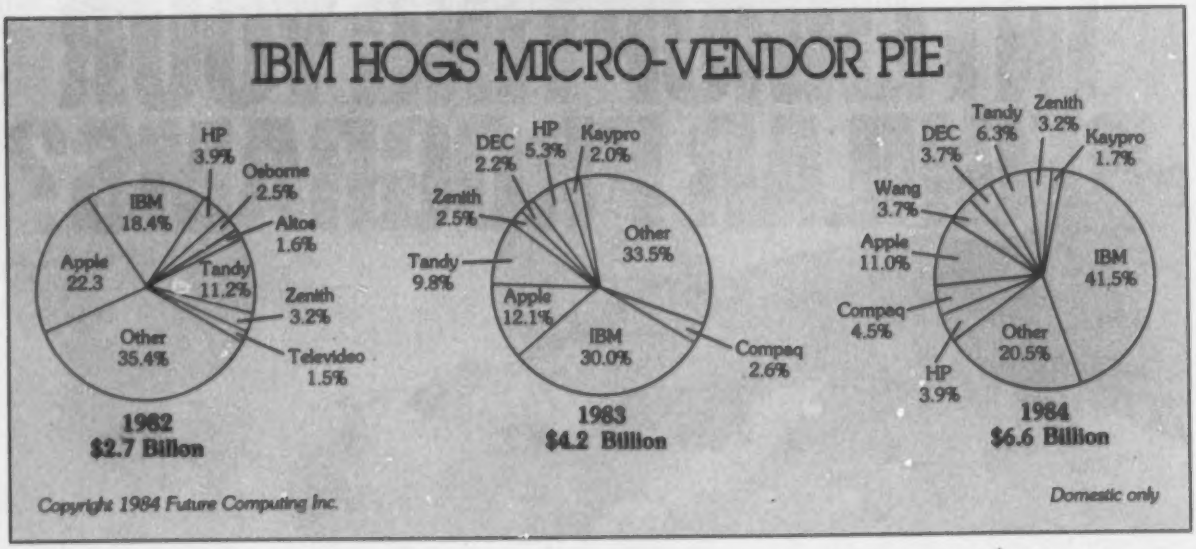
Sam Irwin, CEO at Columbia Data says, "The Columbia personal computer is still very well received, and we have some innovative products that will be brought out before the end of the year."

Frank Wiekel, director of communications at Eagle Computer, says it will remain in the personal-computer business, although 1984 was a difficult year for the company. "There is a place in the market for the smaller companies with attractive products at attractive prices," says Wiekel.

Colony believes the shakeout is underway right now and will continue through the first and second quarters of 1986. The shakeout, according to Colony, is in part a reaction to IBM's growing dominance. "IBM's hegemony has forced major players like Digital Equipment Corp. [Maynard, MA] to retrench and pushed smaller vendors to the brink," he says.

According to a Forrester Research report, the growth of personal computer sales is expected to decline this year. Colony says this slowing in demand for personal computers is contributing to the shakeout.

Although the office personal-computer market is very competitive, there is still room in the top tier for new entrants with ample capital, says a report by Future Computing, *Office Personal Computer Systems Manufacturers: Analyses and Profiles*. Bill Ablondi, vice president of Future Computing, says a shakeout is coming, but it is not immi-



nent. He says the personal computer market will stabilize by the late 1980s or early 1990s. "You'll begin to see a shakeout of the weaker competitors and a stabilizing of the top tier of manufacturers. Many observers claim the shakeout is happening right now, but this isn't true. There are more competitors now than last year," says Ablondi.

The vendors in top positions this year will probably be the industry leaders through the end of the decade, according to the Future Computing report. But, adds the report, other suppliers have a chance at moving to the top as new entrants.

Regardless of when the shakeout happens, the reports indicate that IBM will dominate. Right now Big Blue controls about 40 percent of the office personal-computer market. Apple Computer Inc., Cupertino, CA, is in second place, but there is some disagreement about its future. Colony says Apple's position is far from secure because of its lack of penetration in the business-computing market. Laura Lundquist, office group analyst at Future Computing, disagrees. She says Apple has successfully positioned products in both the home and office markets, which will allow it to remain a strong leader in the industry.

Colony is also skeptical about the future of Tandy Corp., Ft. Worth, TX, in the personal-computer market. Tandy's focus on IBM compatibility is dangerous because IBM changes the rules regularly, he says. Lundquist disputes this. She says, "Tandy has remained third during the past few years, maintaining a stable share of the market. There's a good chance it will keep a position among the top five."

Office Personal Computer Systems Manufacturers: Analyses and Profiles is available from Future Computing for $3,000. For more information, call (214) 437-2400. The report by Forrester is part of the *Professional Automation Report and Bulletin*, which costs $800 a year. For more information, call (617) 497-7090. □

EBB & FLOW

KODAK BUYS FLOPPIES

Eastman Kodak Co. (Rochester, NY), expanding its move into the floppy-disk market, has agreed to acquire *Verbatim Corp.*, the Sunnyvale, CA, floppy-disk manufacturer, for approximately $175 million.

A spokesperson for Kodak says the move will allow Kodak to concentrate on producing high-density magnetic disks and optical disks. Kodak has been making floppy disks on a small scale since last October.

According to industry estimates, Verbatim controls about 20 percent of the floppy-disk market in the United States. Verbatim reported a net income of $15 million for fiscal 1984 and losses of about $250,000 for the second quarter of 1985. Kodak will retain the Verbatim trademark and continue to manufacture floppy disks in Sunnyvale, the spokesperson says.

Bridge Communications Inc., the Mountain View, CA-based manufacturer of Ethernet-based local-area network (LAN) products, has acquired *Coherent Systems Inc.* of Bedford, TX, a manufacturer of broadband radio-frequency modems. Terms of the agreement were not disclosed.

Coherent Systems, formed in 1982, will become Bridge's radio-frequency-products division. According to Bridge, the new division will remain headquartered in Texas. □

(News continued on page 32)

DP SECURITY: A DELICATE BALANCE

Controlling access to dp facilities requires a balancing act between protecting vital resources and enhancing employee productivity. You can't just lock the doors.

by James Miskiewicz

Access control, the linchpin of data-center security, is far more complex than throwing up a chain-link fence, locking the doors, and calling in corporate security.

Securing a data center is a delicate balancing act between providing protection and enhancing productivity. Measures adopted to keep intruders out shouldn't impede employees as they go about their jobs; security systems must be sophisticated enough to catch insiders who become interlopers without imposing draconian restrictions. After all, burdensome security provisions tend to be ignored or circumvented by busy employees.

The high value of information and computer equipment, the threat of computer crime and sabotage, and the spread of devices to combat them is creating a growing need for MIS/dp executives who understand the fundamentals of security and play active roles in the development and enforcement of a security program. These executives help deploy two basic kinds of access-control systems: those that detect intrusion and alert the responsible managers, and those that stop an intruder from gaining access to the data center or prevent employees from entering off-limits areas.

In major corporations the approaches may differ, but the thrust is the same. Limit the number of employees

with access to the data center and the risk of loss or damage will be greatly reduced. For example, programmers working at terminals don't have to go inside the data center; they can work miles away, out of harm's way. If an employee must deliver a report or tape to the data center, he or she can deliver it to a double-doored locker or drop slot without entering the data center. At the Basking Ridge, NJ, data center of Purolater Courier, only a few top managers have keys to the computer room, which is always locked. The mainframes are controlled from a room one floor below the computer room, and access to the control room is restricted to operators.

Security consultants generally advise using redundant security systems. The most frequently promoted concept is layered security systems. Working from outside to inside, the most sensitive areas, such as the machine room or tape library, are accorded the tightest security.

"I tend to use the word 'holistic,' " says Richard Bessenhoffer of Total Assets Protection, an Arlington, TX, consultancy. "A security system can't counter a single problem; it's got to be all-encompassing." According to Bessenhoffer, the layers of security might be categorized most easily into four perimeters, each employing one or more security devices. These perimeters include the area immediately surrounding the building (assuming that yours is a stand-alone center); the perimeter of the building itself, including all possible access points; the entrance to the data center; and finally, areas within the center that are most sensitive and in need of the greatest control.

Systems installed at the outer perimeter generally fall into the surveillance category. Increasingly, data centers are employing some form of motion detection, either infrared or microwave, to alert security to an intrusion at the outer perimeter. Both systems work "point-to-point." A transmitter beams invisible infrared light or an energy field along each side of the perimeter to detectors at the other end. An alarm is set off by any break or disruption in the beam by a "human-sized" object; birds or small animals are detected by the beam but won't trigger the alarm.

Microwave systems, such as GTE's MPS 400, list at $1,530 per unit (one receiver and transmitter), while infrared systems tend to be less expensive. The Admemco 1200 costs about $500 per unit. However, the major cost of these systems is installation. According to Bill Boyd, technical-services manager for GTE Security Products Organization, Mountain View, CA, the cost of installing a motion-detection system can be as much as three times the purchase price of the unit itself.

Both systems have strengths and weaknesses. The microwave system transmits a much wider energy beam and can protect much larger areas than the infrared system; the narrow infrared beam, which is transmitted to a photoelectric cell, is less prone to false alarms. In addition, microwaves can be transmitted 600 feet or farther, while the infrared beam is only effective up to 500 feet.

Motion-detection devices also fit well into what is becoming an increasingly held belief among security experts that data centers and their outer security perimeters should remain as unobtrusive as possible. Thus, one of the oldest forms of access control, the chain-link fence, is fading quickly from most data-center security provisions. The U.S. Department of Justice's report "Computer Security Techniques" contends that "an obvious barrier may attract undesirable attention" and that computer facilities should "look unimpressive and ordinary relative to nearby buildings." The report is available by calling the U.S. Department of Justice's Bureau of Statistics in Washington, at (202) 724-7774.

"Eliminate the normal flow of traffic as much as possible from access points leading to the data center."

"Data centers should look unobtrusive, so as not to attract undesirable attention."

The central data center for Martin Marietta Data Systems in Orlando, FL, uses a motion-detection device for perimeter security. As a defense contractor and dp-services supplier, Martin Marietta requires strict security precautions for its data center.

The level at which pure access control begins is at the entrances to the building or the floor on which the data center is housed. Identify all access points leading to the floor or building and eliminate as many as possible from the normal flow of traffic.

"If you allow employees and visitors to enter the building through many entrances, you're asking for trouble," says Earl Gay of the New York-based security consultancy Brooks-Gay Associates. "Ideally, you'll be able to restrict movement to one or two access points and then control who gets through and how."

The "and how" is as important a feature of the access-control program as any particular security device. Establish access control at the front entrance, loading zones, and such secondary access points as emergency exits. Establish procedures regarding the use of each entry point. Required emergency exits, for example, which lead out of the data-center floor should remain unopenable from the outside. In addition, many security consultants advise establishing rules preventing employees from using emergency routes to move to and from the data center, and tying restricted exits into the central alarm system.

Similarly, the front or main entrance of the data center should include a reception post, the sole function of which should be to identify employees and visitors and log their arrivals and departures. In instances where the actual entrance to the data-center complex is separate from the main entrance, a

second reception post should be established. Although it is common for many reception desks to be equipped with closed-circuit television monitors, Bessenhoffer asserts that these monitors can distract guards from their primary responsibility.

"Once you start placing other responsibilities on the guard, access control begins to break down," says Bessenhoffer. "Plus, it just doesn't make good business sense to install $100,000 worth of TV cameras and monitors when they're only being watched half the time." Rather than install TV monitors at your reception desk, Bessenhoffer suggests that they be placed in a central security office—under the gaze of trained security personnel given the sole responsibility for their monitoring.

So-called back-door access points, such as loading docks and freight elevators, must also be secured. However, because these areas require efficient movement of materials in and out of the building, access-control measures must not impede legitimate movement.

"The loading area is a threat not so much because someone is going to walk off with your mainframe, but because someone wanting to steal a disk or sign on to a terminal is just as likely to use the back door," says Benjamin Klein, director of user services for the City University of New York's computer center.

Klein asserts that the need for efficient movement through loading areas usually comes at the expense of security. The solution at the CUNY computer center was to route all deliveries through the reception area used by data-center personnel. Unfortunately, not all centers are designed to allow this. If the loading dock is behind the data center, security consultants advise the use of some dual-checking system to allow equipment and materials to move in and out of the building.

At the very least, experts advise, delivery personnel should be denied access beyond the loading dock. Therefore, it makes sense to build a storage room for needed media and other materials near the loading dock. Materials might also be left at the dock, to be moved by data-center personnel only. Some corporations, such as Martin Marietta Data, deploy an "air lock." A delivery truck is admitted to an enclosed area where the truck, its cargo, and occupants are closely examined prior to admittance to the loading dock. The vehicle is also checked after the transaction is complete. The system restricts access but provides for the efficient movement of equipment and materials in a secure manner, says Charles M. Elliott, director of quality assurance and security.

Inside the data center, the security perimeters should follow the form of individual rooms and workstation clusters. Security experts recommend laying out work areas to provide security for sensitive offices. Says Earl Gay, "You shouldn't have to stroll past the tape library every time you want to go to the washroom."

The workhorse of interior access control is the locking device. Years ago, these devices were no more than $500 electronic locks with numeric keypads activated by a multi-digit code. In recent years, however, magnetic- and infrared-card readers have all but replaced the older locks. These systems are more expensive, ranging from $1,000 to $3,000 per door, plus installation costs, which can run as high as 30 percent of the system's purchase price. Yet they have become the industry standard for two essential reasons. First, the "combinations" for digital locks can easily fall into the wrong hands, but the combinations on cards are hidden. Second, most systems provide central programming and auditing through hookups to stand-alone computer systems.

"One of the basic concepts about ac-

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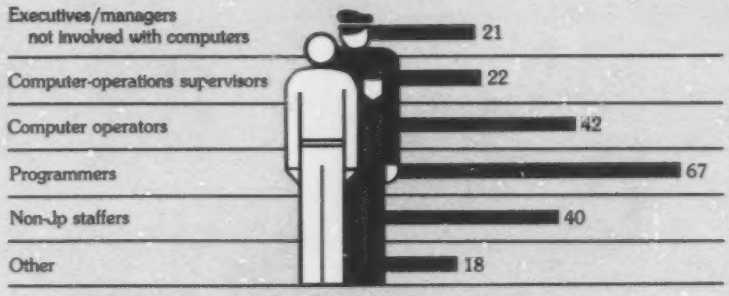

Source: Task Force on Computer Crime/American Bar Association

In recent months, the bulk of attention paid to computer crime has been on so-called "hackers." These electronic thieves—working from remote terminals—do present a serious threat to data centers, but one recent survey conducted by the American Bar Association suggests that an even greater threat to security comes from much closer to home.

When asked to identify known perpetrators of crimes against them, 125 of 160 respondents (77 percent) said criminals came from within their own organizations. The most frequently cited groups were computer operators and programmers.

"Hackers have received all the publicity, but the greatest threat by far still comes from individuals who work in the data center," says Richard Bessenhoffer, vice president of Total Assets Protection, an Arlington, TX, consultancy.

The survey questionnaire was distributed to Fortune 500 industrials and to federal, state, and local government agencies. The 179 respondents fielded questions ranging from estimates on total annual losses due to computer crime in the United States, to views on the need for a federal statute on the punishment of computer criminals; 79 percent favored such a law.

cess control is that not everyone in the organization should have access to every part of the data center. Upper management may have unlimited access, but as you move down the organizational chart, access should be more selective, defined by individual workstations if possible," says CUNY's Klein. CUNY's computer center separates low-security offices from more sensitive areas, such as terminal rooms and the computer room.

One clear example of this type of compartmentalization is the data center for the Fisher-Camuto Co., a fast-growing women's-footwear manufacturer and retailer in Stamford, CT. According to Ken Scharf, MIS/dp vice president, entry to the data center is restricted by a magnetic card reader from Card Key Systems (Chatsworth, CA). Within the center, the card-reader system's programming establishes security levels that restrict employee movements according to individual needs to enter certain areas.

Scharf explains that although administrative offices are open to employees with appropriate identification cards, programming areas are restricted at night to programmers on the night shift. Access to the computer room itself is restricted at all times to operators. The computer room is glass-enclosed, but employees may communicate with each other using an intercom built into the center's telephone system. An operator may leave the computer room to deliver a job, but programmers and managers cannot go in.

The software available for most card-activated systems provides flexibility by matching an individual's access code against a database. Systems can control as many as 40 access points and track as many as several hundred thousand employees' access codes. They can also be programmed to limit access only to certain doors and only during times when the employee is authorized to be present in the data center. These systems generally keep records of who was present when, in the event that some crime or sabotage within the data center is detected.

But card readers are not foolproof. Magnetic cards can be duplicated. And while easier to use than the digital lock, the need to either inject a card or flash one past a reader is regarded by many employees as an inconvenience. When that occurs, employees may be tempted to circumvent the security measures simply to make their lives easier. One MIS/dp manager, who prefers not to be named, says he found that in certain high-traffic areas employees simply propped a chair against the door, defeating the access-control system.

Ultrasophisticated detectors such as voice-activated, fingerprint, or handwriting-analysis systems still have a long way to go before becoming cost-

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CIRCLE 56

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CIRCLE 59

ACCESS CONTROL

(Continued from page 110)

effective for all but the tightest security facilities. Also the technology to make these systems cost-effective has not yet been developed. Voice-analysis systems, for example, currently require the installation of a soundproof booth and special voice-transmission lines at every door.

However, significant developments have been made in systems that require a minimum of physical effort on the part of the user. The so-called "handless" systems, according to security consultants, are the first to address the problem of making the access-control system easy to use.

One such device available is the Proximity System developed by the Schlage Electronics Corp., a big lock vendor based in San Francisco. The system, which costs approximately $1,500 per door, plus installation, combines all the central programming capabilities of the typical card-activated system with an ultrasensitive reader that requires an employee only to hold the card two to three inches from the sensing device. Although not a purely "handless" system, the Proximity System doesn't require the user to insert an access card, which can remain in a wallet or clipped onto the user in the form of a security badge.

In addition, the system's sensing device can be embedded within a wall, leaving no evidence of its presence. Not only does that make the system more aesthetically pleasing, says the manufacturer, but it also adds an extra measure of security because an intruder might not be able to find the sensor, assuming he or she has stolen some employee's card.

Another "no-hands" device is the Mastiff Security System, from Atlanta-based Mastiff Systems U.S. Inc., which combines good access control with convenience for the user. Mastiff, which is an acronym for Modular Automated System to Identify Friend from Foe, uses a radio transmitting device and receiver to activate the locking system. A specially coded frequency is transmitted by a 3.2-ounce "token" worn by personnel during working hours. The device has a range of four feet and provides an audit trail. If the wearer of a card is out of range of the receiver, an alarm will sound if the door remains open for more than nine seconds.

> "Access-control measures must not impede legitimate movement."

But because of the system's special installation requirements, such as the need for raised floors around the door to house the system's radio-receiving antenna, Mastiff concedes that its product may still be limited to certain applications rather than as the primary automated-locking system. The system costs from $5,000 to $10,000 per door, which makes it a significantly larger investment than card-reader systems made by Continental Instruments, Card Key, and Rusco. However, the manufacturer asserts that the Mastiff system can be cost-effective in data centers with high-security needs and heavy user traffic.

Trusted employees circumventing access-control measures, either to commit a crime or simply to avoid an inconvenience, are another type of problem. There's no technology that will solve that problem. Also, MIS/dp management, rather than the security staff, is best equipped to cope. Security directors will more often than not contend that their special training and expertise make them the obvious choice for the planning and management of security programs throughout the organization.

"Under most corporate structures, the corporate security department is responsible for protecting the assets of the organization. Information is every bit as much an asset as people and physical property, but because it is best understood by MIS/dp management, a dedicated MIS/dp approach to the security of information is advisable," says Martin Marietta Data's Charles Elliott.

The proponents for MIS/dp control of security point out that the unique nature of computer operations makes it difficult for non-dp professionals to understand the security needs of the data

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center. The corporate security director may well understand, for example, how to protect inventory sitting in a warehouse or equipment in an office, but the idea of storing assets on a disk or a tape is outside his or her experience.

"The problem is that security professionals don't know enough about MIS/dp to help a whole heck of a lot," says CUNY's Benjamin Klein. As former director of a major financial-services institution's dp department, Klein has been dismayed at the inexperience of many security experts in protecting computer-related assets. Their focus tends to be on hardware, rather than data, which might represent far greater assets, he says.

However, consultants caution MIS/dp executives from becoming overly guarded in their responsibility for data-center security. In fact, most security consultants prefer to see the establishment of closer working ties between the dp and security personnel rather than a move by MIS/dp toward self-sufficiency in security. One of the most frequently cited solutions to the dilemma is to educate security personnel in fundamental computer operations.

"Right now, there is very little in the way of education for corporate security personnel except trial and error," says Robert Courtney, an independent security consultant and chairman of the Data Processing Advisory Council to the U.S. Department of the Treasury. Courtney urges clients to establish classes for security personnel in the fundamentals of MIS/dp as part of comprehensive security programs. "You can't protect something if you don't understand what you're protecting, let alone what you're protecting it from," he says.

Jan Larsen, corporate-security director for Pfizer Inc., New York, and a chief architect of the pharmaceutical maker's data-center security program, says it is important to continuously air various and at times widely differing views on data-center security. "I found that when you put together enough experts, you get very different views on what's important to secure and what's not," says Larsen. "But it's only within that debate that the security director can begin to get a total picture of the corporation's data-center security needs."

Thus, the final component of a good physical security system is not hardware, but the ability of those responsible for the data center to test the effectiveness of the security measures they have developed and to make improvements. To do otherwise would be to break the first rule of security: Never assume you are secure enough. □

James Miskiewicz is a free-lance writer based in Flushing, NY.

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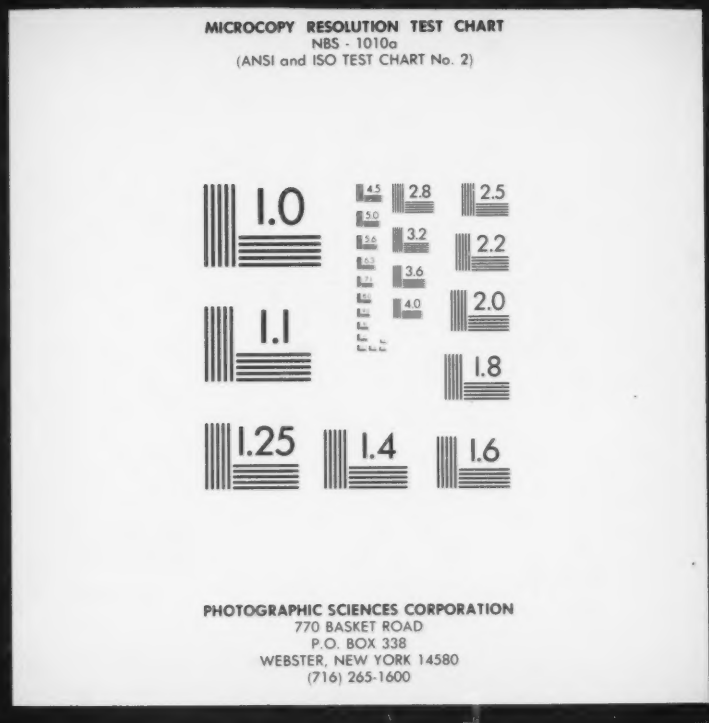
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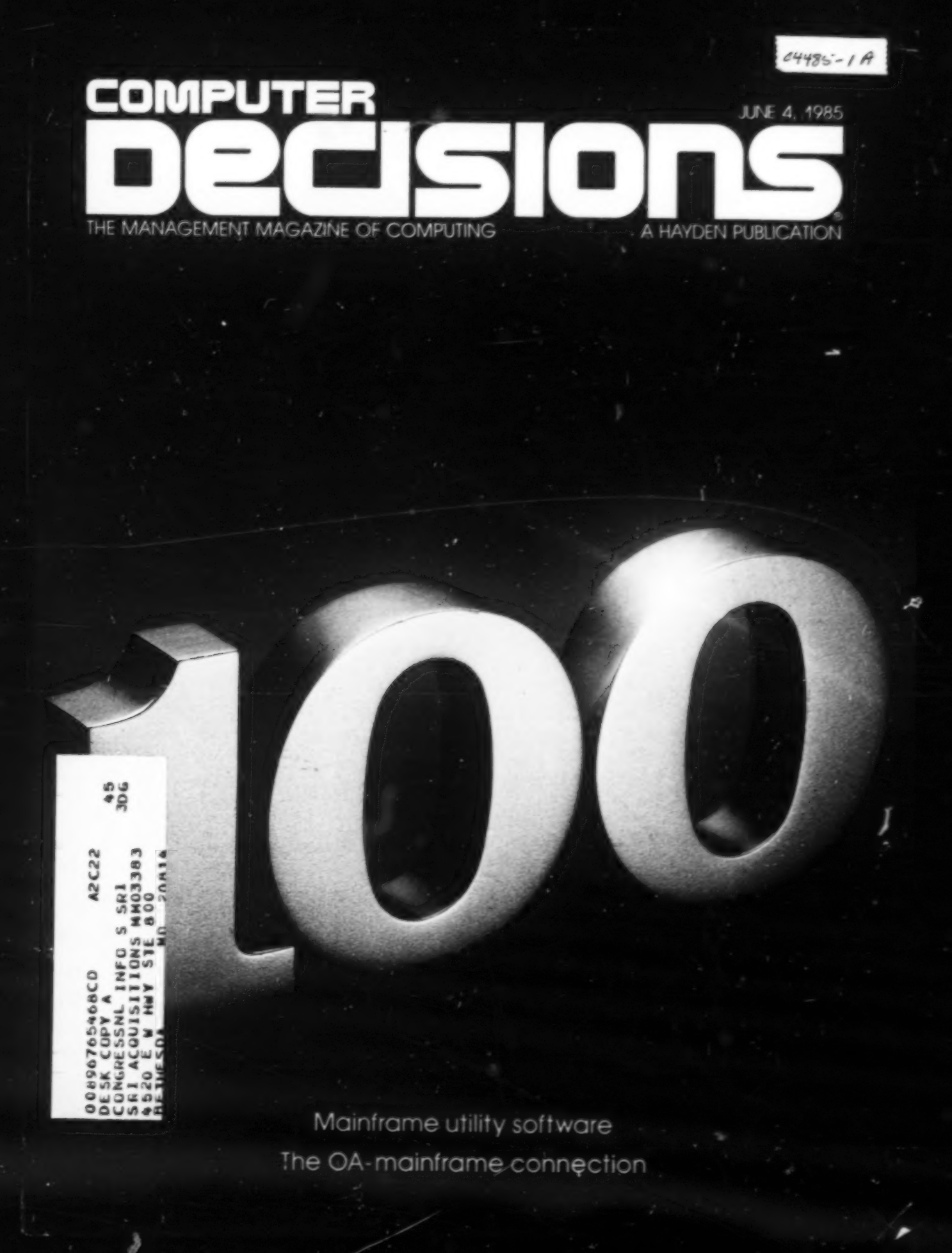

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Mainframe utility software

The OA-mainframe connection

COMPUTER DECISIONS

June 4, 1985 Volume 17 Number 11 Copies printed: 182,103

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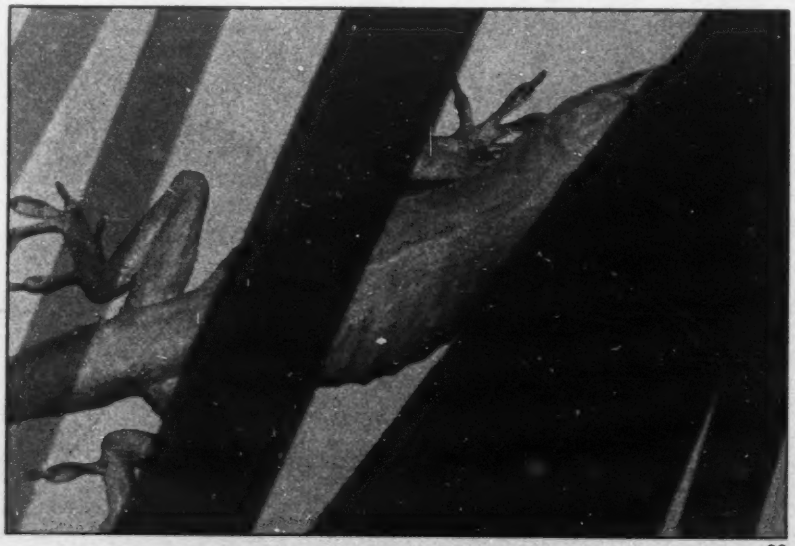

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COVER STORY

1984: THE GOOD NOT-SO-OLD DAYS

Riding market waves in trim with avid competitors and the strong dollar, the top 100 dp vendors had—or acquired—the right stuff.

by Lee Keough, Industry Editor

Nineteen eighty-four was a year of vigorous activity for the data-processing industry. The long-awaited shakeout in the microcomputer market finally began. Mergers, acquisitions, and bankruptcies were commonplace. And more than a few vendors had soaring sales and hefty profits. The *Computer Decisions* 100 charts these sometimes turbulent changes, listing newcomers as well as vendors who have made major moves within the ranking.

The total revenues of the *Computer Decisions* 100 grew at a healthy, if not robust, rate of 18.9 percent over 1983's aggregate. For the first time, the combined sales of the top-100 vendors surged past the $100 billion mark to $109 billion—an increase of $20 billion over 1983. Reflecting this increase, it took revenues of more than $123 million for a vendor to make the 1985 top-100 ranking, as opposed to $96.3 million for 1984's top 100.

Despite 1984's volatile climate, the year was a good one for many vendors. With the current trend decidedly downward, many executives may find themselves wishing for a return of 1984's roller-coaster ride. Presently, many vendors are suffering from flat sales and few profits. Even IBM, which caused much of 1984's handwringing, is having a tougher time (see "Summit Up Blue").

There are 13 new names on the *Computer Decisions* 100, the most notable being AT&T. In prior years, the telecommunications giant was represented by its subsidiary, Teletype Corp. A change in reporting procedures, together with AT&T's entrance

(Continued on page 72)

COMPUTER DECISIONS 100

Company	'84 Rank	'83 Rank	'84 Revenues (000)	'83/'84 Growth (%)	'83 Revenues (000)
†IBM (Armonk, NY)	1	1	$43,459,000	16.3	$37,367,000
Digital Equipment Corp. (Maynard, MA)	2	2	6,229,629	29.1	4,826,800
Burroughs Corp. (Detroit)	3	3	4,520,800	12.0	4,038,000
Control Data Corp. (Minneapolis)	4	4	3,755,500	7.1	3,507,000
NCR Corp. (Dayton, OH)	5	5	3,664,748	9.9	3,333,188
Sperry Corp. (Blue Bell, PA)	6	6	3,474,000	13.1	3,072,000
Hewlett-Packard Co. (Palo Alto, CA)	7	7	3,269,000	32.0	2,476,000
Wang Laboratories (Lowell, MA)	8	8	2,421,145	35.1	1,792,400
Apple Computer Inc. (Cupertino, CA)	9	11	1,897,947	75.1	1,084,000
Honeywell Inc. (Minneapolis)	10	9	1,825,000	9.5	1,666,000
Xerox Corp. (Stamford, CT)	11	10	1,300,000	6.4	1,222,000
Data General Corp. (Westboro, MA)	12	16	1,274,915	47.0	867,100
*McDonnell Douglas Corp. (St. Louis)	13	26	1,228,556	126.7	542,000
Commodore International Ltd. (West Chester, PA)	14	13	1,209,400	24.8	969,000
TRW Inc. (Cleveland)	15	12	1,200,000	18.2	1,015,000
AT&T (New York)	16	-	1,030,000	-	-
Automatic Data Processing Inc. (Roseland, NJ)	17	17	958,287	17.4	816,000
General Motors/Electronic Data Systems (Dallas)	18	22	947,419	31.8	718,737
General Electric Co. (Fairfield, CT)	19	18	875,000	8.0	810,000
Storage Technology Corp. (Louisville, CO)	20	15	808,584	-8.7	886,000
*Harris Corp. (Melbourne, FL)	21	24	788,000	43.3	550,000
Amdahl Corp. (Sunnyvale, CA)	22	19	779,400	0.2	777,680
Tandy Corp. (Fort Worth, TX)	23	14	719,060	-23.9	945,000
Texas Instruments Inc. (Dallas)	24	20	713,640	-3.4	739,000
Computer Sciences Corp. (El Segundo, CA)	25	21	709,634	-1.3	718,880
Epson America Inc. (Torrance, CA)	26	37	675,000	80.0	375,000
Northern Telecom Ltd. (Mississauga, Ontario, Canada)	27	30	650,000	32.7	490,000
Prime Computer Inc. (Natick, MA)	28	28	642,720	24.4	516,503
Motorola Inc. (Schaumburg, IL)	29	29	618,000	20.2	514,000
Datapoint Corp. (San Antonio, TX)	30	25	600,539	9.6	547,872
National Semiconductor Corp. (Santa Clara, CA)	31	31	600,000	23.5	486,000
ITT Corp. (New York)	32	27	575,000	10.0	522,500
Computervision Corp. (Bedford, MA)	33	33	556,342	39.1	400,032
*Telex Corp. (Tulsa, OK)	34	52	550,725	149.2	221,000
Tandem Computers Inc. (Cupertino, CA)	35	32	518,414	15.1	450,516
Dataproducts Corp. (Woodland Hills, CA)	36	39	484,516	37.5	352,327
C. Itoh Electronics Inc. (Los Angeles)	37	38	470,000	30.6	360,000
Mangement Assistance Inc. (New York)	38	34	441,701	13.6	388,654
Intergraph Corp. (Huntsville, AL)	39	48	403,762	60.2	252,014
Mohawk Data Sciences Corp. (Parsippany, NJ)	40	36	403,047	5.0	384,000
Racal Data Communications (Sunrise, FL)	41	35	400,000	3.4	387,000
Tandon Corp. (Chatsworth, CA)	42	40	398,401	15.9	343,885
Tektronix Inc. (Beaverton, OR)	43	42	389,067	28.5	302,797
Martin Marietta Data Systems (Bethesda, MD)	44	46	371,000	32.5	280,000
Convergent Technologies Inc. (Santa Clara, CA)	45	67	366,790	125.0	163,000
Minnesota Mining and Manufacturing Co. (3M) (St. Paul, MN)	46	41	345,500	8.3	319,000
Compaq Computer Corp. (Houston)	47	90	320,000	187.7	111,221
Seagate Technology (Scotts Valley, CA)	48	51	303,937	36.9	222,020
Paradyne Corp. (Largo, FL)	49	56	289,981	38.8	208,900
Sanders Associates Inc. (Nashua, NH)	50	49	287,300	26.0	228,100

Growth due largely to acquisition.
-Not ranked among Computer Decisions Top 100 in 1984.
†Includes 1984 revenues of Rolm Corp.

Company	'84 Rank	'83 Rank	'84 Revenues (000)	'83/'84 Growth (%)	'83 Revenues (000)
Boeing Co. (Seattle)	51	47	$270,000	-1.8	$275,000
NEC Information Systems Inc. (Boxborough, MA)	52	58	270,000	35.0	200,000
Shared Medical Systems Corp. (Malvern, PA)	53	54	256,753	21.8	210,814
Perkin-Elmer Corp. (Norwalk, CT)	54	57	250,200	20.9	207,000
Zenith Electronics Corp. (Glenview, IL)	55	84	240,000	92.0	125,000
Cray Research Inc. (Minneapolis)	56	64	228,752	34.8	169,690
Schlumberger Ltd. (New York)	57	53	225,000	4.7	215,000
Apollo Computer Inc. (Chelmsford, MA)	58	-	215,930	167.7	80,659
Dysan Corp. (Santa Clara, CA)	59	63	214,094	20.3	178,000
GTE Corp. (Stamford, CT)	60	-	210,000	-	-
Gould Inc. (Rolling Meadows, IL)	61	55	207,500	-0.7	209,000
Gerber Scientific Inc. (South Windsor, CT)	62	80	202,616	50.1	135,000
Grumman Corp. (Bethpage, NY)	63	69	198,000	26.1	157,000
Informatics General Corp. (Woodland Hills, CA)	64	59	191,193	-3.4	197,892
NBI Inc. (Boulder, CO)	65	76	191,143	35.7	140,810
Diebold Inc. (Canton, OH)	66	62	190,000	6.7	178,000
Quotron Systems Inc. (Los Angeles)	67	70	189,799	23.4	153,810
Planning Research Corp. (McLean, VA)	68	68	186,501	16.8	159,697
Xidex Corp. (Mountain View, CA)	69	79	180,000	33.3	135,044
CPT Corp. (Minneapolis)	70	61	178,636	-7.0	192,000
UCCEL Corp. (formerly Wyly) (Dallas)	71	71	173,433	14.1	152,000
Centronics Data Computer Corp. (Hudson, NH)	72	66	171,504	4.5	164,129
Micom Systems Inc. (Chatsworth, CA)	73	89	171,323	50.7	113,699
Dun & Bradstreet Corp. (New York)	74	75	170,000	18.1	144,000
Verbatim Corp. (Sunnyvale, CA)	75	72	168,914	14.6	147,379
Reynolds & Reynolds Co. (Dayton, OH)	76	73	165,834	12.8	147,000
Televideo Systems Inc. (San Jose, CA)	77	65	163,012	-3.4	168,718
First Data Resources Inc. (Omaha, NE)	78	85	161,900	31.9	122,760
General Datacomm Industries Inc. (Middlebury, CT)	79	100	161,263	67.4	96,333
Signal Companies Inc. (La Jolla, CA)	80	77	160,000	14.3	140,000
Lotus Development Corp. (Cambridge, MA)	81	-	156,978	196.1	53,007
Cipher Data Products Inc. (San Diego)	82	-	151,303	64.5	92,000
Cullinet Software, Inc. (Westwood, MA)	83	98	150,484	53.7	97,877
Decision Data Computer Corp. (Horsham, PA)	84	92	147,017	41.6	103,823
Printronix Inc. (Irvine, CA)	85	94	146,649	44.7	101,317
Management Science America Inc. (Atlanta)	86	78	141,800	2.0	139,055
Recognition Equipment Inc. (Irving, TX)	87	87	140,140	19.8	117,000
National Data Corp. (Atlanta)	88	81	139,961	6.2	131,808
ISC Systems Corp. (Spokane, WA)	89	95	138,703	37.2	101,079
Continental Telecom Inc. (Atlanta)	90	83	138,000	9.5	126,000
Fidata Corp. (formerly Bradford National) (New York)	91	82	135,400	4.6	129,500
Intecom Inc. (Allen, TX)	92	-	131,678	65.9	79,370
Computer Consoles Inc. (Rochester, NY)	93	93	131,189	26.7	103,550
Applied Data Research Inc. (Princeton, NJ)	94	-	128,200	43.9	89,086
Microsoft Corp. (Bellevue, WA)	95	-	125,000	81.2	69,000
Miniscribe Corp. (Longmont, CO)	96	-	123,610	61.4	76,591
Telerate Inc. (New York)	97	-	122,566	54.9	79,145
Altos Computer Systems (San Jose, CA)	98	-	121,829	47.9	82,394
Intelligent Systems Corp. (Norcross, GA)	99	-	121,297	65.8	73,168
Triad Systems Corp. (Sunnyvale, CA)	100	-	120,207	30.5	92,099

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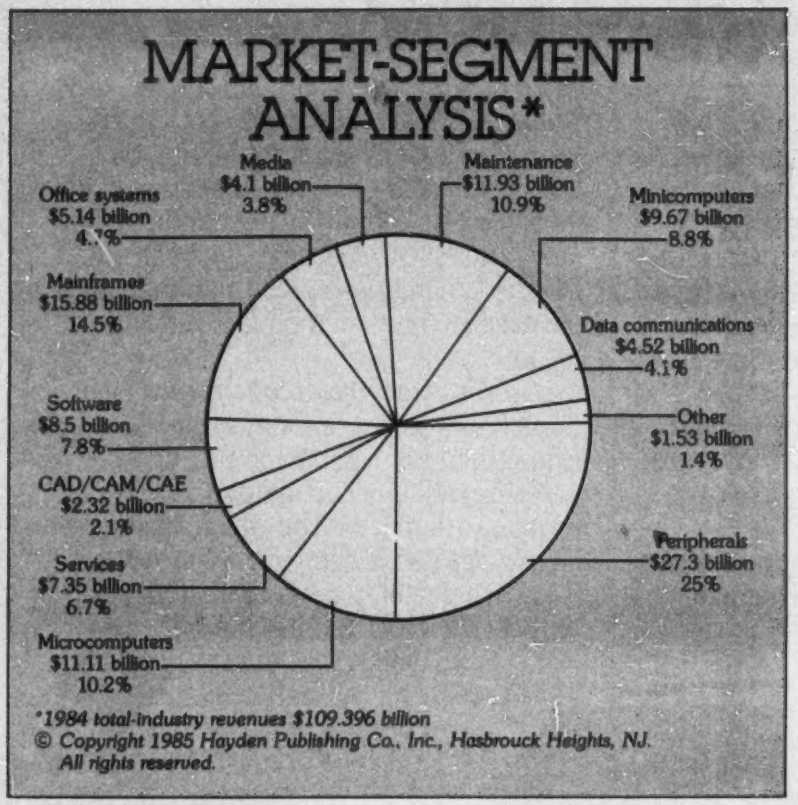

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to dp competition, was responsible for AT&T's inclusion. Despite its perch among the top-20 vendors, AT&T's entrance into dp was an inauspicious one, with most of its $1 billion in revenues derived from its private-branch-exchange (PBX) and terminal businesses combined with increased software-licensing fees. AT&T's computer sales tote up to less than $60 million. Analysts say it may be too early to predict whether AT&T can successfully compete against IBM, because the corporation formerly and familiarly known as Ma Bell is still adjusting to the competitive marketplace and learning how to become a market-driven vendor.

GTE Corp. and Intecom Inc. also made the list by virtue of a change in reporting procedures to include data and digital PBXs. Although Intecom's $79.4 million revenues in 1983 would not have earned it a place on last year's ranking, its high rate of growth now places it on the list of Fast Trackers (see "Life in the Fast Lane").

Other newcomers include: microcomputer-software maker, Lotus Development Corp.; Apollo Computer Inc., a spectacularly successful marketer of computer-aided design/engineering workstations; Telerate Inc., a leading computerized financial network; Altos Computer Systems, which markets multi-user microcomputers; and software developer, Applied Data Research Inc. Triad Systems Corp., the vertical marketer of turnkey systems, returns to the ranking after a one-year absence.

Some vendors making the list for the first time benefited from high-flying markets, and most of the newcomers are listed among the Fast Trackers. Microsoft Corp. and Intelligent Systems Corp. prospered in the volatile microcomputer business, and Miniscribe Corp. and Cipher Data Products Inc. succeeded in marketing storage systems to original equipment manufacturers, a perilous business in 1984.

Dp revenues showed an increased demand for smaller systems in 1984.

These 13 vendors have displaced other not-so-fortunate corporations. Three vendors left the rankings due to acquisition. Their 1984 revenues were melded with those of the new parent organizations, regardless of the take-over date. These include terminal manufacturer Raytheon Data Systems, which was acquired by The Telex Corp. in July; Lanier Business Products Inc., which was taken over by Harris Corp.; and Tymshare Inc., which was acquired by McDonnell Douglas Corp. As a result, McDonnell Douglas, Telex, and Harris leapfrogged up the rankings.

Communications vendor Rolm Corp. was swallowed up by IBM and, of course, Big Blue retained its position at the top of the heap. For purposes of comparison, IBM's revenues include Rolm's dp sales for the entire year—not just as of November, when it was acquired. Without Rolm, IBM would have been listed as garnering $42.8 billion in dp sales, a healthy, but not spectacular, 14.7 percent gain over 1983.

The acquisition of Electronic Data Systems Corp. of Dallas by General Motors Corp. had no effect on our ranking, except that EDS is now listed as GM. In future years, it will be interesting to see how the acquisition affects the computer-services giant.

The merger madness of 1984 continues into the current year. If planned acquisitions go through, next year's list will be without the names of Verbatim Corp., which is being acquired by Eastman Kodak Co., Rochester, NY, and Dysan Corp., which was merged with Xidex Corp. Management Assistance Inc., which was liquidated in January, will also be among the missing next year.

Allied Corp., the Morristown, NJ, conglomerate, sold its computer-maintenance business to Eaton Corp., Cleveland, leaving only the $120 million Bunker Ramo Corp. (Morristown, NJ) computerized financial network under its wing. Allied is now too small to make the ranking. Exxon Corp.,

New York, sold its troubled Exxon Office Systems to Harris Corp. and Olivetti Corp., Tarrytown, NY, early in 1985, but Exxon Office Systems' poor 1984 performance kept it off our ranking.

Others that didn't rack up enough sales to make our ranking were transaction-processors Anacomp Inc., Indianapolis, and Commerce Clearing House, Chicago; array-processor manufacturer Floating Point Systems Inc., Portland, OR; computer-services vendor Interactive Data Corp., Waltham, MA (now owned by Chase Manhattan Bank, New York); office-systems vendor Nashua Corp., Nashua, NH; Atari, Sunnyvale, CA; and Ericsson Inc., the U.S. subsidiary of the Swedish industrial giant, located in Greenwich, CT.

Inclusion on the *Computer Decisions* 100 is not necessarily a barometer of healthy sales and profits. Storage Technology, for example, is No. 20 in dp sales and in Chapter 11 as well. (For more on Storage Technology and others that fared poorly last year, see "Tossing and Downturning.")

Once again, the sales revenues of "the Bunch"—Burroughs, Sperry (formerly Univac), NCR, Control Data, and Honeywell—did not parallel the average growth of the industry, but for the first time in years, each of the heavyweight mainframe vendors increased its sales revenues. Sperry Corp. had the best year of the group, with a revenue increase of more than 13 percent. It was profitable, too, despite its having to take a writedown on its investment in Trilogy Inc., Gene Amdahl's failed attempt to develop wafer-scale integration. Sperry's reorganization and its emphasis on integrated systems were pluses in 1984. Sperry's large installed customer base and tradition of being the major supplier to the federal government make it an attractive takeover target. Although merger talks with ITT failed this past spring, it's possible Sperry will find another suitor.

Burroughs Corp. also performed relatively well in 1984. Analysts say its mainframe business was healthy and it has had success with its B25 workstation—Burroughs' version of the Convergent Technology Inc. NGen.

Despite 1984's volatile climate, the year was a good one for many vendors.

Memorex, the Burroughs susidiary that makes mainframe peripherals in competition with IBM and Storage Technology. But it continues to have difficulties despite a reorganization. Memorex recently laid off 225 employees, but said it cut staff to remain profitable, not to survive.

Another mainframe vendor, Honeywell Inc., reduced its workforce this spring. Corporate officials blamed the problem on the poor performance of its small computer systems and general market conditions, but Honeywell had a lackluster year in 1984.

For minicomputer vendors Digital Equipment Corp., Data General Corp., and Hewlett-Packard Co., 1984 was a very good year indeed—demonstrating the increase in demand for smaller systems. With a revenue increase of nearly 30 percent, DEC has firmly ensconced itself as the second-largest computer maker, and is pulling away from the pack. Data General jumped four places in the ranking with a remarkable 47 percent increase in sales, and now nudges the top 10. DEC and Data General performed well despite disappointments in the micro market; DEC absorbing its failed Rainbow, and Data General balancing slow early sales of its lap-top, Data General/One.

This year looks a bit different, however. DEC's earnings fell 11 percent in the quarter ending March 31, even though revenues increased 18 percent. Data General reported even worse results—evidence of declining demand in the market.

Office-automation vendor Wang Laboratories followed a similar script, but with the added impediment of its own organizational problems and competition from Big Blue. After a highly successful year in 1984—the latest in a string of good years—Wang took a sudden nosedive, resulting in a 66 percent drop in earnings for the period ending March 31, and a meager 2 percent gain in revenues. Wang executives have taken 10 percent pay cuts, and the vendor plans to shut its domestic manufacturing plants for two weeks next month.

Even corporations playing in hot markets felt the pinch in early 1985. Computervision Corp., the computer-aided design/manufacturing (CAD/CAM) pioneer, grew nearly 40 percent last year despite dropping one spot in the ranking. But Computervision has watched while small startups outsold it in the related computer-aided-engineering market, and it's now facing a serious challenge in the CAD/CAM market from Intergraph Corp. and Big Blue. When general market conditions plunged this year, Computervision was forced to dismiss 14 percent of its workforce.

Whether the current downward trend will continue throughout the year is a matter of conjecture. Sandy Gant, an analyst with Infocorp, a Cupertino, CA, market-research house, theorizes that the market's decline is connected to the phenomenal number of microcomputers purchased in 1984. "A lot of money was spent last year," says Gant, "and now managers are trying to figure out what to do with all those micros. In the fourth quarter, executives are going to be ready for solutions to integration problems and looking for better and additional file-servers and interconnections."

William F. Zachmann, vice president of corporate research at International Data Corp, Framingham, MA, disagrees. Zachmann predicts the second half of 1985 will be worse than the first. The problem, he says, is the economy as a whole.

Whether Gant or Zachmann is right, it does seem clear that it will be nearly impossible for the industry to continue its growth pattern of the past few years. With the first part of 1985 lacking in high-fliers to balance out those hovering close to the ground, it's going to be tough to achieve $125 million in aggregate sales to make next year's *Computer Decisions* 100.

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UP & COMERS LEAP INTO THE LIMELIGHT

Each year, a few small vendors parlay shrewd management strategies and a bit of good fortune into the stellar performance that makes them expand spectacularly. For the following 15 companies, 1984 was that kind of year. All reported sales upward of $50 million, and earnings-growth rates of 50 percent or more over 1983's.

Most of the Up & Comers were 1984's major players in ballooning niche markets, such as computer-aided engineering (CAE). For some, sales were bolstered by accelerated market demand for their wares, and more than one boasts of having helped to carve the market niche they hope will support their climb. Then there are the purists—vendors that simply offer terrific products.

Along with Apollo Computer Inc., a fast-tracker on the *Computer Decisions* 100, Sun Microsystems in Mountain View, CA, invented the CAE business, says Jan Lewis, an analyst with Infocorp, a Cupertino, CA, market-research house. Sun Microsystems combined a standard 32-bit microprocessor, high-resolution screen, and high speed into a networked workstation that makes it possible—and affordable—for every engineer to have a supermini on his or her desk. Infocorp estimates the CAE market will grow at a quicker rate than the already fast-paced information-processing industry.

That's good news for another CAE-workstation vendor, Daisy Systems Corp. in Mountain View, CA. Although Daisy Systems' performance doesn't parallel Apollo's or Sun's, it's also expected to continue on its high-growth path. To insure Daisy's future success, 16.2 percent of its 1984 revenues have been reinvested in research and development—a function at which 45 percent of Daisy's employees work.

Another vendor that created its own market niche is Iomega Corp. in Ogden, UT, the creator of the "Bernoulli Box," a disk-storage system for microcomputers based on a uniquely designed disk drive. Ironically, Iomega's innovation almost cost it its

success. Iomega targeted original equipment manufacturers (OEMs) as a prime market for its Bernoulli Box. But OEMs wouldn't integrate the Bernoulli Box into their systems because it could be obtained only from Iomega. So the vendor marketed the disk drive as a backup system—a product IBM did not offer—and sales of the Bernoulli Box took off.

Tallgrass Technologies Corp. in Overland Park, KS, has found a comfortable slot in the same market niche. Tallgrass produces a micro backup-storage system based on a tape drive. A private company that grew out of an initial investment of only $5,000, Tallgrass is run by David M. Allen, who has a graduate degree in Soviet studies, and Steven Volk, a zoologist with a degree in dentistry. Although not formally trained in high technology, Allen and Volk have put together a highly successful data-processing vendor.

It may come as no surprise that the data-communications explosion has resulted in success for several small vendors. Ungermann-Bass Inc. in Santa Clara, CA, began marketing LANs in 1979, and was one of the first vendors to network equipment from different manufacturers. In 1984, using a design compatible with Ethernet's (the LAN from Xerox Corp.), Ungermann-Bass offered the Net/One line of LANs—both baseband and broadband—available with thin coaxial cable or fiberoptic cable. The key question facing Ungermann-Bass is whether it can withstand the onslaught of competition.

Competition doesn't seem to be a problem for Network Systems Corp. in Minneapolis, which markets Hyperchannel, a high-speed LAN that connects supercomputers to mainframes. "They have the market pretty much to themselves," says Samuel Talbot of Growth Stock Services Inc., in Boston. "The competition won't find it easy to beat Network Systems," Talbot notes, adding that company officials would have to rest on their laurels for a competitor to do so. And James Thornton, chairman of the board and chief executive officer of Network Systems, says complacence is not a company trait. Network plans to sustain its 50 percent sales-growth rate over the next few years by bringing out new products ahead of its competition.

Timeplex of Woodcliff Lake, NJ, was another early entrant in the data-communications market. It was one of the first vendors of the T-1 multiplexer—the engine that still drives the company—according to William Flanagan, strategic-marketing manager of Timeplex. "It was one of the first products of its kind that worked," notes Richard Amster of the Yankee Group. But the T-1 mux has been on the market for some time, and now several startup vendors have entered the fray.

Another company driven by the success of a single product line is Digital Communications Associates Inc. (DCA) in Norcross, GA. Its line of Irma micro-to-mainframe links dominated the market in 1984, says David Terrie. But the market for simple protocol converters is flattening out, he adds, and now 20 to 25 vendors are offering the same product. "I'm not sure DCA has the next golden product," says Terrie.

But a vendor doesn't have to break into an emerging market to become a hot, high-growth company, as Wyse Technology (San Jose, CA) has proven. Wyse stacks up those profits with a priced-right product that offers more features for the money, says Greg Blatnik, an industry analyst with Data-

UP & COMERS

No.	Company	Main business	'84 Revenues (000)	'83/'84 Growth (%)	'83 Revenues (000)
1	Iomega Corp.	Micro storage systems	$ 51,600	628.4	$ 7,084
2	Wyse Technology	Peripherals	59,640	384.4	12,312
3	Sun Microsystems Inc.	CAD/CAM/CAE	70,000	250.0	20,000
4	Daisy Systems Corp.	CAE	81,588	188.1	28,320
5	Corona Data Systems Inc.	Microcomputers	66,100	175.4	24,000
6	Tallgrass Technologies Corp.	Micro storage systems	60,000	172.7	22,000
7	Computer Memories Inc.	Micro storage systems	90,587	120.2	41,134
8	Ashton-Tate	Software	82,300	106.8	39,800
9	Ungermann-Bass Inc.	Data comm.	52,300	105.9	25,400
10	Digital Communications Assoc. Inc.	Data comm.	67,537	103.2	33,241
11	Emulex Corp.	Data comm.	98,008	80.5	54,290
12	Ultimate Corp.	Minicomputers	92,814	78.5	52,008
13	Timeplex Inc.	Data comm.	82,152	55.9	52,698
14	Computer Associates International Inc.	Software	116,091	51.4	76,694
15	Network Systems Corp.	Data comm.	71,179	51.3	47,030

To qualify as a Computer Decisions Up & Comer, vendors must have marketed a general data-processing product, had more than $50 million in revenues for 1984, and experienced a sales-growth rate of at least 50% over 1983's.

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quest, a Cupertino, CA-based market-research house. Wyse is the leading independent maker of video-display terminals, holding a 17 percent share in the full-editing, block-mode-terminal market. That figure is up from only 4 percent in 1983, according to Dataquest estimates. When its competitors experienced internal problems, Wyse found itself in pouncing position.

Emulex Corp. in Costa Mesa, CA, was a company that benefited from two exploding markets last year: data communications and microcomputers. A supplier of storage subsystems for Digital Equipment Corp. (DEC, Maynard, MA) minicomputers, Emulex soon began offering products that link micros to VAX machines. In February 1984, Emulex acquired Personal Systems Technology, Inc. (Persyst), which markets enhancements for the IBM PC. "Acquiring Persyst was a sensible move," says Samuel Talbot of Growth Stock Services. "Emulex is going after the IBM market the way it went after the DEC market."

Officials at Corona Data Systems Inc., Thousand Oaks, CA, a vendor of IBM PC-compatibles, have a sanguine attitude toward their continuing profitability in 1985. "We can react quickly to changing conditions in the marketplace," says Randy Rodman, a spokesman for the clonemaker. "And we'll always stay cheaper than IBM."

Founded in 1981 by Dr. Robert Harp, formerly of Vector Graphic Inc. (Thousand Oaks, CA), Corona generates 40 percent of its sales from OEMs. Even with a soft microcomputer market, Rodman says Corona can continue to grow due to its many OEM contracts. "We plan to approach the $100 million mark this year," he adds.

The microcomputer-market downbeat, however, should not affect demand for microcomputer software, according to most industry observers. And Ashton-Tate (Culver City, CA), creator of dBase II and dBase III—two of the most popular micro packages—could benefit. A seasoned software vendor, Ashton-Tate is poised to break into the upper echelon of data-processing vendors with Framework, an integrated package. Although Framework has received many positive reviews, it's still being outsold by its arch-competitor, Symphony, from Lotus Development Corp. in Cambridge, MA.

Software is the key to success for two other Up & Comers: Computer Associates Inc. (Jericho, NY) and The Ultimate Corp. (Clark, NJ). The Ultimate Corp. assembles minicomputer systems that run the Pick operating system, which allows for sophisticated database management. Ultimate is expected to be one of the top-two Pick vendors in 1985, according to Rich Lauer, vice president of marketing for Pick systems. The other is McDonnell Douglas Computer Systems Co. in Irvine, CA, formerly known as Microdata Corp.

While Ultimate's success is dependent on one system, Computer Associates (CAI) has invested in more diverse product lines, and markets microcomputer software as well as mainframe systems. Charles Wang, president of CAI, aims to make his company the number-one independent supplier of software. With its heavy investment in research and development, its practice of acquiring complementary vendors, and steady internal growth, this is not an unrealistic goal for CAI.

Nineteen eighty-four may have been a boom year in some computer-industry markets, but vendors still had to capitalize on whatever situation was at hand. If the Up & Comers continue to do things right, it's likely you will see more than a couple of them on the *Computer Decisions* 100 next year.

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THE LOW FLIERS

No.	Company	'84 Rank	'83 Rank	'83/'84 Growth (%)	'84 Revenues (000)	'83 Revenues (000)
1	*Tandy Corp.	23	14	-23.9	$ 719,060	$ 945,000
2	Storage Technology Corp.	20	15	-8.7	808,584	886,000
3	CPT Corp.	70	61	-7.0	178,636	192,000
4	Texas Instruments Inc.	24	20	-3.4	713,640	739,000
5	Informatics General Corp.	64	59	-3.4	191,193	197,892
6	Televideo Systems Inc.	77	65	-3.4	163,012	168,718
7	The Boeing Co.	51	47	-1.8	270,000	275,000
8	Computer Sciences Corp.	25	21	-1.3	709,634	718,880
9	Gould Inc.	61	55	-0.7	207,500	209,000
10	Amdahl Corp.	22	19	0.2	779,400	777,680
11	Management Science America Inc.	86	78	2.0	141,800	139,055
12	Racal Data Communications	41	35	3.4	400,000	387,000
13	Centronics Data Computer Corp.	72	66	4.5	171,504	164,129
14	Fidata Corp. (formerly Bradford National)	91	82	4.6	135,400	129,500
15	Schlumberger Ltd.	57	53	4.7	225,000	215,000
16	Mohawk Data Sciences Corp.	40	36	5.0	403,047	384,000
17	National Data Corp.	88	81	6.2	139,961	131,808
18	Xerox Corp.	11	10	6.4	1,300,000	1,222,000
19	Diebold Inc.	66	62	6.7	190,000	178,000
20	Control Data Corp.	4	4	7.1	3,755,500	3,507,000

*Figures obtained from company estimates.

TOSSING AND DOWNTURNING

Nineteen eighty-four held all the terror of an Orwellian nightmare for the executives of the 20 worst performers on the *Computer Decisions* 100. While most of the data-processing industry was enjoying the last leg of a sustained and dramatic sales climb, these businesses had plummeting sales and scanty profits.

Tandy Corp. showed the most drastic revenue reduction, with a drop of nearly 24 percent from 1983. Despite the lowered revenues, Tandy officials say they sold 50 percent more computers during the last half of the year than were sold in the corresponding period in 1983. But Tandy was forced to slash the price of its pioneering Radio Shack TRS-80 microcomputers because of increased competition from vendors that offer products with more features.

Texas Instruments Inc. was another early micro maker that crashed in 1984. Texas Instruments could no longer count on sales of its low-cost 99/4A home computer, which it withdrew from the market in 1983, after selling about a million. And the lack of compatibility with the IBM PC caused business-computer users to shy away from Texas Instruments' more powerful products.

The hardships of Tandy and Texas Instruments appear mild compared to those of Storage Technology Corp. Although it checks in at No. 20 on the *Computer Decisions* 100, Storage Technology plunged into bankruptcy by the end of 1984, after racking up debts comparable to its total annual sales.

The shakeout in the disk-drive business caused hardships for many vendors, including Xerox Corp., which phased out Shugart small disk drives. But the giant copier maker is having tough times across its dp-product line. Xerox' printer subsidiary, Diablo, did poorly. Its Star workstation has been a disaster, and it dropped its battery-powered portable microcomputer.

Another segment of the industry that's in trouble is timesharing. Control Data Corp. is one of several vendors that experienced lack of demand, in large part, due to the rise of the microcomputer. It's difficult for Computer Sciences Corp., The Boeing Co., and National Data Corp. to scout out customers when previous clients are eschewing their timesharing services and filling corporate-dp needs with micros. Informatics General Corp. sold its timesharing business during 1984, a year of transition for the marketer of software and turnkey systems.

One surprise on the list of Low Fliers is Diebold Inc., the maker of automatic-teller machines. Diebold has faced weaker demand than expected, compounded by troubles in the banking industry.

Unfortunately for the 20 corporations on the list of Low Fliers, dp sales as a whole have sagged during the first half of 1985. The Low Fliers now face the difficult job of rebounding in a depressed market, when they found it difficult to eke out a profit in a year that was good for the industry as a whole. It will take a colossal achievement for these vendors to turn out 1985 performances equal to those stockholders relished in headier days.

LIFE IN THE FAST LANE

While the data-processing industry hummed along at an easy pace last year, 20 vendors on the *Computer Decisions* 100 listing tore through 1984 at breakneck speed. Not surprisingly, these corporations, which had the highest revenue-growth rates, emerged as champions of the hotly contested personal-computer, micro-software, and data-communications markets.

Lotus Development Corp. scored with the most successful software to date, the 1-2-3 integrated-function package. Too small to make the 1984 top-100 ranking, Lotus clocks in this year at No. 81. Lotus followed up its 1-2-3 success with Symphony, a fully integrated spreadsheet and word-processing package, and capitalized on its reputation among business users.

However, Lotus had a few setbacks in the first quarter of this year. Sales were down, and Lotus was very late with Jazz, its integrated package for the Macintosh from Apple Computer Inc. (At presstime, Jazz was scheduled to be shipped May 27—months late.) Another problem for Lotus is its continued dependence on a single need—spreadsheets.

Lotus recently aligned itself with Cullinet Software Inc., a mainframe-software developer that makes the list of Fast Trackers for the second year in a row. In a joint venture, Lotus and Cullinet have developed a link between 1-2-3 and IBM mainframes. Also, Lotus has acquired Software Arts in Wellesley, MA, the developers of Visicalc, the pioneer of spreadsheet packages, and has announced its intention to acquire Dataspeed in Cambridge, MA. Software Arts will diversify Lotus' appeal with a desk-top-organizer package and programs for engineering and scientific applications. Dataspeed, a vendor of transmission hardware, would be Lotus' first foray into hardware.

Microsoft Corp. is the one software vendor that could pose problems for Lotus. Microsoft has a broad product line, and has announced Excel, a product aimed, like Jazz, at the Macintosh. The developer of the micro operating

system MS-DOS, which IBM adapted for its Personal Computer, Microsoft is the maker of Multiplan and Microsoft Word.

Microsoft also has a stake in the success of Apple Computer. Despite its seminal role in the development of the IBM PC, Microsoft derives 25 percent of its revenues from software packages used on Apple products. Egil Juliussen, chairman of Future Computing Inc., the market researchers based in Richardson, TX, believes Microsoft's diversity will protect it from a crash.

One of the Fast Trackers, Convergent Technologies Inc., hit the profit skids during 1984. A supplier of desk-top and mini-computers to such giants as Burroughs Corp. and NCR Corp., Convergent graces the list of high-fliers for the second year running.

But Convergent grew a bit too rapidly without sufficient financial controls. The result was cash-flow problems and losses for the last two quarters of 1984. Its problems also stemmed from a disastrous attempt to sell briefcase microcomputers directly to end users. But analysts believe new management may turn Convergent around by instituting tighter financial policies and better pricing of the NGen workstation. If Convergent's Unix-based microcomputer—developed for AT&T—takes off, it could get back on course.

These 20 vendors have the proven mettle to prevail, perhaps even in the presently downturning market.

The microcomputer market was not for the faint of heart during 1984, but two vendors demonstrated extraordinary might, even if Big Blue emerged the big winner. Compaq Computer Corp. is arguably the success story of the year, as it nearly tripled its revenues and proved that a corporation can make it manufacturing an IBM compatible. Big Blue even tried to outclone this cloner with the portable PC.

But Compaq's original portable continues to outsell IBM's version, and the three-year-old Compaq has announced an array of new products, including the Deskpro desk-top micro and the TeleCompaq computer phone, covering more market bases. Shipments and profits in the first quarter of 1985 slowed a bit, but Compaq's strong position on retail shelves should solidify its enviable position, say analysts.

Apple Computer Inc. didn't do too badly, either, despite its current troubles. Sales of the Apple II line surged during the Christmas season, its Macintosh is highly regarded and attracting a small army of software developers, and Apple has been releasing products that will put users on communicating terms with IBM machines. But despite a healthy quarter ending March 31, Apple has been retrenching, laying off thousands of temporary workers, eliminating hundreds of full-time jobs, and cutting benefits and other costs. Due to sluggish sales, Apple discontinued the Macintosh XL microcomputer, only months after it was renamed from the Lisa and remarketed. While few are predicting doom for Apple, the paramount question is whether corporate users can find room for a product that's incompatible with the IBM PC.

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Zenith Data Systems, a subsidiary of Zenith Electronics Corp., has been the quiet success among micro makers, offering fully IBM-compatible desk-top and portable computers and add-on devices to original equipment manufacturers, as well as end users. "They targeted discriminating users," says James Magid, an analyst with L.F. Rothschild, Unterberg, Towbin, the Wall Street brokerage, "and they're succeeding because they have a superior product."

Zenith is among the leading microcomputer suppliers to colleges and universities because of its micros' flexibility and graphics capabilities. Also, last October, Zenith was awarded a $100 million Pentagon contract for micros for the U.S. military. Zenith has developed a specialized technology that prevents electronic eavesdropping, and it has already benefited from a $30 million Pentagon contract awarded to it in 1983.

Micro-related businesses were profitable for other Fast Trackers. Epson America Inc. sold printers to Big Blue for attachment to its PC, as well as through retail outlets at lower cost. But this joyride may end abruptly, as IBM has announced an end to its contract with Epson. It remains to be seen whether Epson can find a replacement for IBM's heavy requirements. Miniscribe Corp., the maker of 5¼-inch disk drives for the IBM PC XT, could face a similar dilemma.

The success of microcomputers has also brightened Intelligent Systems Corp., which markets enhancement products through its subsidiaries Quadram Corp. in Norcross, GA, and Princeton Graphic Systems in Princeton, NJ. Another subsidiary, Datavue Corp. in Norcross, GA, distributes an IBM-compatible portable. Originally, Intelligent Systems' business was color-graphic terminals for use in computer-aided-design and manufacturing (CAD/CAM). It's still in this business, selling terminals for use in computer-aided-engineering (CAE), but more than 60 percent of Intelligent Systems' revenues are derived through its enhancement products.

A number of other vendors profited from the hot CAD/CAM/CAE market, particularly Apollo Computer Inc., Intergraph Corp., and Gerber Scientific Inc. Although Intergraph and Gerber Scientific experienced flat sales in the most recent fiscal quarter, analysts believe this is more an effect of the down-turned market than of corporate problems or dubious strategies.

Apollo Computer Inc., though, continues to soar. One of the first to capitalize on new semiconductor technology, Apollo offers engineers relatively low-cost technical workstations. One possible cloud on Apollo's horizon is the expected entrance of IBM and Digital Equipment Corp. into the CAE arena, but it's still a young market with few contenders.

The other major expanding market in 1984 was data communications. General Datacomm Industries Inc., Intecom Inc., and Micom Systems Inc. all benefitted from the deregulation of the common carriers and the ever-increasing need to link computers. Some analysts point to 1985 as the year of the local-area network, and Apollo is already hanging tough in that ballooning market.

With the current sag in the high-technology industry, the performance of these vendors and the other Fast Trackers could slow. Whether they will careen off course will not only depend on the market as a whole—and the economy—but on the success of their corporate strategies. Still, these 20 vendors have the proven mettle to prevail, so it would not be surprising to see them racing ahead of the *Computer Decisions* 100 again next year.

FAST TRACKERS

No.	Company	'84 Rank	'83 Rank	'83/'84 Growth (%)	'84 Revenues (000)	'83 Revenues (000)
1	Lotus Development Corp.	80	-	196.1	$ 156,978	$ 53,007
2	Compaq Computer Corp.	46	89	187.7	320,000	111,221
3	Apollo Computer Inc.	57	-	167.7	215,930	80,659
4	*Telex Corp.	33	51	149.2	550,725	221,000
5	*McDonnell Douglas Corp.	14	26	126.7	1,228,556	542,000
6	Convergent Technologies, Inc.	44	66	125.0	336,790	163,000
7	Zenith Electronics Corp.	54	83	92.0	240,000	125,000
8	Microsoft Corp.	94	-	81.2	125,000	69,000
9	Epson America Inc.	26	36	80.0	675,000	375,000
10	Apple Computer Inc.	9	11	75.1	1,897,947	1,084,000
11	General Datacomm Industries, Inc.	78	99	67.4	161,263	96,333
12	Intecom Inc.	91	-	65.9	131,678	79,370
13	Intelligent Systems Corp.	98	-	65.8	121,297	73,168
14	Cipher Data Products Inc.	81	-	64.5	151,303	92,000
15	Miniscribe Corp.	95	-	61.4	123,610	76,591
16	Intergraph Corp.	38	47	60.2	403,762	252,014
17	Telerate, Inc.	96	-	54.9	122,566	79,145
18	Cullinet Software Inc.	82	97	53.7	150,484	97,877
19	Micom Systems Inc.	72	88	50.7	171,323	113,699
20	Gerber Scientific Inc.	61	79	50.1	202,616	135,000

*Growth due largely to acquisition.

- Not ranked in 1983.

SUMMIT UP BLUE

IBM delivered another strong performance in 1984, wreaking havoc in the microcomputer market and helping to send its nearest competitor in large storage systems into bankruptcy. But 1985 may be remembered as the year IBM came to grips with several weaknesses. If the giant from Armonk hopes to achieve the huge annual gains to which it has become accustomed, it will either have to toughen its soft spots or score another success similar to that of the Personal Computer.

In 1984, IBM once again reaped data-processing revenues totaling more than the combined sales of the remaining top-20 dp vendors. Even more impressive, IBM's after-tax profits were not only greater than the total revenues of the second-largest computer maker, Digital Equipment Corp., but were the highest of any corporation in the world. And if anyone is left flat by those achievements, IBM garnered more than 10 percent of its sales from a product line that did not exist five years ago—its PC family.

IBM had an excellent year in its major business—mainframe computers—and scored big with its large storage systems, delivering a near-fatal blow to Storage Technology Corp. IBM also performed admirably in software and made a move to bolster itself in its weaker market, telecommunications, by acquiring the third-largest PBX maker, Rolm Corp., Santa Clara, CA.

Yet, IBM's performance last year failed to equal that of a year earlier. IBM may be the only corporation in the world for which an overall $5 billion gain in sales and 14.3 percent growth rate (including non-dp revenues) would not meet the most optimistic of expectations. IBM's stated goal is to grow at the same rate as the rapidly growing data-processing industry—an annual average of 15 percent in recent years. That's a very tall order, even for a mammoth like IBM.

While no one is predicting losses for IBM, most analysts agree it will be difficult, if not impossible, for Big Blue to attain a 15 percent revenue-growth rate this year. "IBM was below plan in 1984 and will be unable to meet its plan this year," predicts Francis Gens, director of research for the Yankee Group, the Boston-based market-research house.

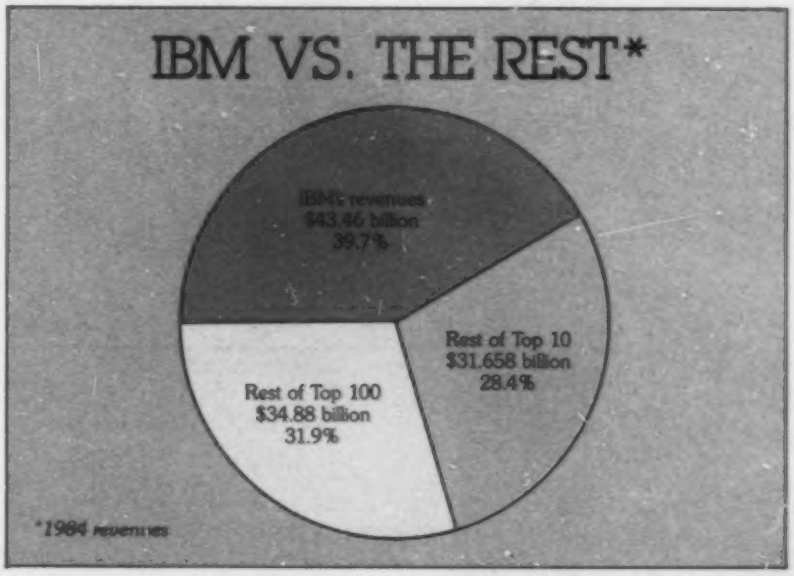
Analysts believe that much of IBM's success last year is attributable to the triumph of the PC and IBM's continued dominance in the mainframe and large storage-systems markets. Last year, IBM maintained its dominant 70 percent share of the mainframe business, says industry observer Brian Jeffery at the International Technology Group in Palo Alto, CA. The difficulty facing IBM in 1985 is a slackened microcomputer market and a drop-off in orders for mainframes. The downturn in mainframe orders, according to Jeffery, began in the fourth quarter of 1984, as buyers anticipated the introduction of a new IBM mainframe, known as the Sierra. The Sierra was unveiled February 12 as the 3090 series.

Of course, micros and mainframes were not the only successes scored by IBM in 1984. Software revenues were up more than 38 percent to nearly $3.2 billion. Maintenance revenues increased by 15 percent, and IBM became a major player in the computer-aided design/manufacturing market,

which Jeffery predicts will contribute $1.2 billion in revenues by 1988.

IBM has positioned itself for continued success in the software business, according to Bob Djurdjevic, publisher of the *Computer Annex Report*, Phoenix, AZ, by requiring users to pay for mainframe software on a monthly basis, rather than allowing a one-time charge. Djurdjevic warns users that IBM is driving them into migration paths that will lead to continual increases in the cost of their software. "IBM is in a controlling position, because it's the only game in town for operating-system software," says Djurdjevic.

Spectacular success in certain markets has enabled IBM to hide its difficulties, contends Brian Jeffery. Analysts point to IBM's disappointing performance in mid-range systems and office-



automation products, and say IBM's lack of a coherent strategy in communication products is a trouble spot.

IBM's vulnerabilities were evident in its financial statement for the first quarter of 1985. Earnings were down 18 percent and its gross revenues were up less than 2 percent over the same period in 1984. The two reasons cited for the weaker performance were the strong dollar and fewer installations of mainframes and high-end storage systems. And no longer can IBM rely on a revenue boost by encouraging users to purchase equipment rather than rent it, say analysts. This policy of converting rentals to sales was accomplished by drastically raising the rental price of IBM systems, but the end of that cycle is drawing near, they say.

IBM also faces organizational challenges. With the notable exception of the development of the Personal Computer, Jeffery contends that IBM's Independent Business Unit (IBU) concept has been a failure. In 1980, John Opel, then chief executive officer, created the IBUs, which are small, semi-autonomous IBM divisions set up to foster innovation. The IBU strategy resulted in

IBM's lack of a coherent strategy in communications is a trouble spot.

the greatest IBM success in recent memory—the PC line. Other IBUs, devised for robotics, analytical instrumentation, and biomedical systems, have been obscured by kudos for the PC, says Jeffery.

Despite these mixed results, new CEO John Akers plans to continue the IBU concept. In a February speech given in Switzerland, Akers said: "Success or failure, the IBU concept gives us a tool to explore and nurture new opportunities with a degree of freedom seldom found in large companies."

Whether or not the IBUs can produce new triumphs, there is room for improvement in IBM's existing product line. By acquiring Rolm, IBM may find a way to offer seamless links between all its office products. Users have been clamoring for such connections, which IBM's systems currently lack. Whether Rolm will be a total solution is the "$64 million dollar question."

In mid-range systems, IBM appears to be banking on extensions of the PC AT, which is being positioned as a multi-user system. At a recent seminar sponsored by the Yankee Group, it was predicted that IBM's strategy is to produce desk-top machines that support many users with the power of mainframes and the maneuverability of microcomputers—attacking minicomputer vendors from above and below.

Big Blue's market dominance has built monumental profits, but it must shore up flat performances in the markets between those profit peaks. IBM may accomplish that if it can harness the creative energy of its IBUs and develop a coherent communications strategy. Never a dull performer, analysts agree that whatever weaknesses IBM has, it's still one of the most successful corporations in the world. "Having produced $46 billion in revenues and $6.6 billion in profits last year, IBM is doing very well," says Bob Djurdjevic. "It's just not doing as well as it would have us believe." □

ACKNOWLEDGEMENTS

The *Computer Decisions* 100 is ranked by data-processing revenues as defined below, for the 12 months ending Dec. 31, 1984. In the event a corporation has an unusual fiscal year—a quarter ending in November, for example—revenues from the last four quarters ending before December are used. Wherever possible, *Computer Decisions* attempted to obtain information directly from vendors. For those corporations who are in more than one line of business and did not provide assistance, *Computer Decisions* turned to knowledgable analysts.

Data-processing revenues are defined as including sales and rentals of mainframes, minis, micros, disk and tape drives, other peripherals, CAD/CAM/CAE systems, office-systems hardware, and data-communications equipment, such as modems, multiplexers, and digital and data PBXs.

Also included are software, maintenance, and computer-service revenues.

Specifically excluded are revenues related to common-carrier communications, electric and electronic typewriters, electronic cash registers, instrumentation, semiconductors, board-level computers, printed circuit boards, automatic test gear, forms, papers, and companies engaged primarily in leasing and retail operations.

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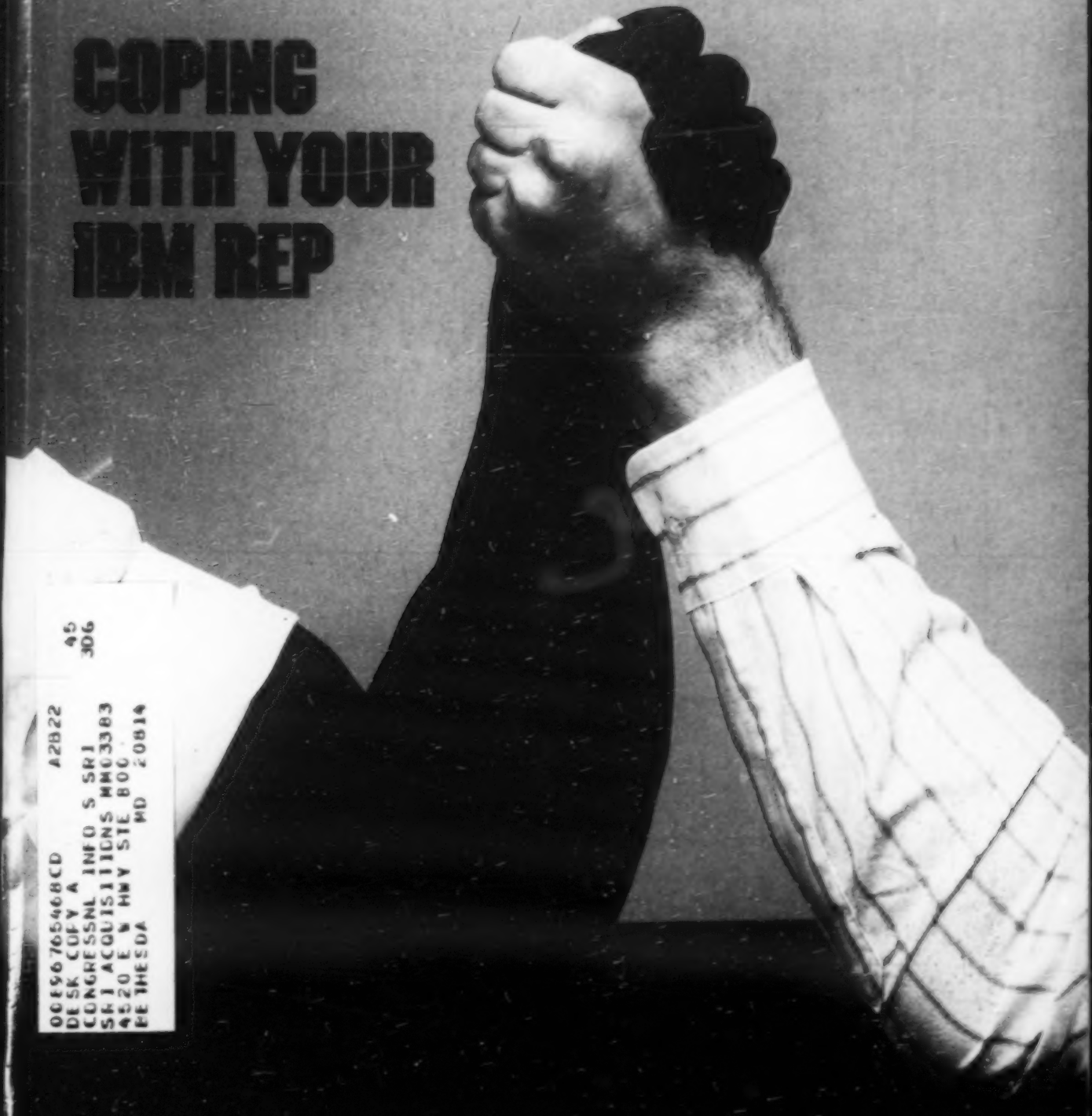

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COVER PHOTO: George Hausman

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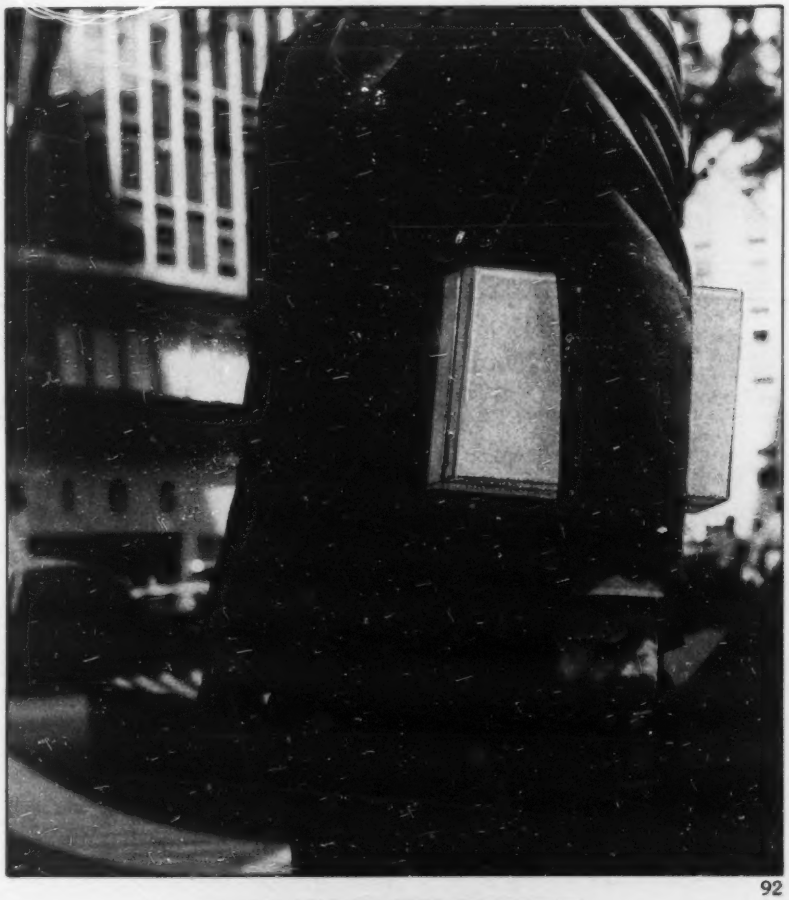

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SPACE PITCH

(Continued from page 21)

as long as they get them from IBM.

According to Marc Butlein, vice president of the Gartner Group, Stamford, CT, market researchers, conserving space may be important to dp managers, but it's not a critical factor in choosing equipment. "Our studies show that reliability is far and away the driving force in purchasing processors and peripherals," comments Butlein. "Customers seem to be able to live with larger equipment if they have to."

Butlein's comments echo the responses of many users for whom "reliability" is synonymous with IBM. The MIS director of a large western utility, who requested anonymity, says that in his shop, size would be almost the last consideration in choosing new hardware. "Staying with single-vendor [IBM] service is most important to us," this manager contends, adding that when IBM produces smaller gear, he'll buy it.

Bill Baker, assistant vice president of the First National Bank of Chicago, concedes that his data center is plagued by a space shortage. "We've overflowed the floor where our computer room is located, and put all our disk drives on another level," Baker says. But, he adds, reliability and supportibility are key issues, not size. He is phasing out disk drives from Storage Technology Corp., the Louisville, CO, vendor currently in federal proceedings to avoid bankrupcy, and will replace them with IBM 3380s, making his data center almost totally an IBM shop.

Even for managers not so committed to IBM, a small footprint is little more than a passing consideration in computer purchasing. Martin Fernandez, who as manager of computer services at Union Oil Corp., Los Angeles, oversees both IBM and Sperry equipment, says he would "make space" for needed equipment rather than buy hardware only because it took up less room. —*Michael Dobberstein*

INSURANCE WOES

(Continued from page 21)

general agent, has received three reports of false certificates of insurance in different parts of the country in the past year, says executive vice president Bruce Brownyard. Brownyard says he knows of "quite a few" guard services that do not have insurance. An unscrupulous security agency that copies an old policy and changes the name and date would fool about 95 percent of its customers, says Robert McCrie, editor of the *Security Letter*, a newsletter published in New York twice monthly.

Tom Keating, chairman of the public relations committee for the Committee of National Security Companies, a security agency lobby, says he has not heard of bogus insurance certificates being used by security firms. He suggests no respectable service of any size could get away with deceiving its customers, and adds that checking an agency's insurance should be "common business homework" for agency clients.

Obtaining insurance has been tougher for all industries, but it has hit high-risk industries like security agencies the hardest, Keating says. Two years ago, there were 25 insurance carriers writing liability insurance for security agencies; now there are only two or three, Brownyard says.

As a result, security guard agencies have been forced to cut back their insurance coverage and pay more for what insurance they have. Brownyard says he knows of large security agencies that have cut back coverage from $200 million two years ago to $10 million this year. He knows of one California security agency that saw its insurance bill rise from $37,000 to $547,000 this year. Of course, the increased costs of insurance will be passed on to corporate clients. □

PORTABLE ALLEGIANCES

Portable Vendors	1985 %	1984 %	1983 %
Compaq Computer Corp.	50.0	38.4	10.3
IBM Corp.	25.9	51.7	6.2
Data General Corp.	17.6	–	–
Radio Shack Div. Tandy Corp.	16.7	10.8	6.7
Hewlett-Packard	12.0	3.9	7.7
Kaypro, Div. Non-Linear Systems Inc.	10.2	15.8	23.7
Apple Computer Inc.	8.5	15.8	6.7
Epson America Inc.	3.7	–	4.1
Grid Systems Corp.	2.8	3.4	2.1
Panasonic Consumer Products	2.8	–	–
Wang Laboratories Inc.	2.8	4.4	–
Burroughs Corp.	1.9	–	–
Columbia Data Products Inc.	1.9	5.9	–
NEC Information Systems Inc.	1.9	–	–
Osborne Computer Corp.	1.9	–	54.6
Texas Instruments Inc.	1.9	3.9	12.4
Zenith Data Systems	1.9	–	–

Source: Computer Decisions' 1985 Brand Recognition Study

Illustration by Vincent J. Gallo

The changing fortunes of portable-computer vendors are reflected in three years' worth of surveys of Computer Decisions readers as to which brands of portables they are considering buying. For example, Compaq Computer Corp. (Houston) was seen as a substitute for IBM's portable in 1984, but the data for 1985 indicate the reverse now seems to be true. Some buyer confusion obviously exists—neither Burroughs Corp. (Detroit) nor Wang Laboratories Inc. (Lowell, MA) offers a portable model.

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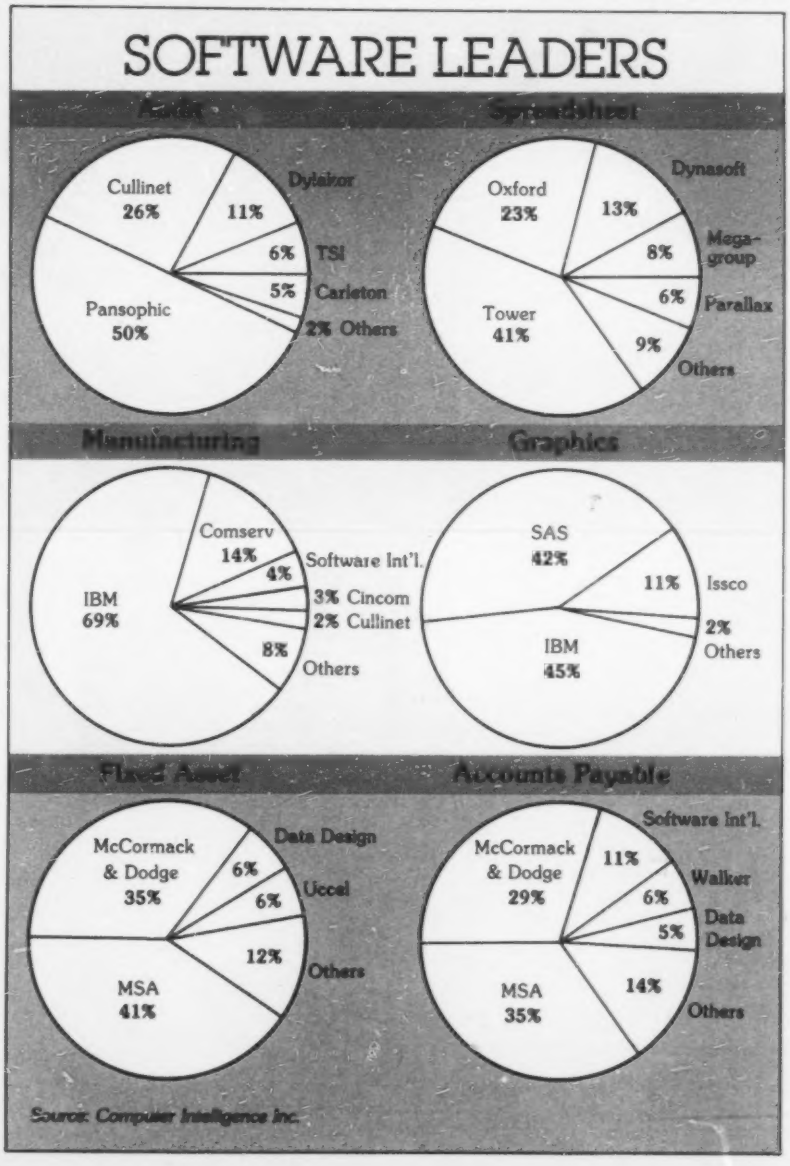
SURVEY: MSA DOMINATES MAINFRAME APPLICATIONS

IBM may be the king of mainframe systems software vendors, but a recent survey conducted by Computer Intelligence Inc. shows Management Science America Inc. (MSA) to be the leading vendor of mainframe applications software in six of 12 categories.

The La Jolla, CA-based research outfit obtained the survey data from more than 11,000 IBM and plug-compatible mainframe sites last March. The figures were collected in the Application Software volume, which is published by Computer Intelligence's System Trend Service.



Previous Computer Intelligence surveys revealed that IBM accounts for about 43 percent of the mainframe systems software programs installed at the same 11,000 sites. Its nearest competitor, Computer Associates International Inc. of Jericho, NY, has 10 percent of the installed systems software base.

But in the March survey of 12 mainframe applications software categories, Atlanta-based MSA came out number one six times. MSA's Accounts Payable System was used at 35 percent of the sites with a vendor-supplied accounts-payable package; its Accounts Receivable System was used in 58 percent of the shops with a vendor-supplied accounts-receivable package. Other top MSA packages were Fixed Asset Accounting System, which accounted for 41 percent of the vendor-supplied fixed asset packages used; General Ledger System, 30 percent; Payroll, 71 percent; and Payroll/Personnel System, 48 percent.

The survey results also show that, for many applications, software developed in-house is more widely used than vendor-supplied packages. Of all the accounts-payable and -receivable, fixed asset, general ledger, payroll, and personnel applications being used at the 11,000 sites, more than 75 percent were created internally, according to the survey.

One possible reason for the wide use of in-house applications is that many in-house financial accounting systems have grown so huge and complex that MIS/dp managers shy away from the job of replacing them with commercial packages, the report concludes.

The research house says recent surveys have shown a decrease in the use of in-house applications. According to the survey, all the auditing, data analysis, graphics, spreadsheet, and manufacturing control applications used at the 11,000 sites were vendor-supplied. □

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